Development of Freshwater Nutrient Criteria for Virginia:

Academic Advisory Committee Recommendations to DEQ

Stakeholders Meeting
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Background:

“Nutrient criteria” are components of water quality standards.

EPA has required that all states develop nutrient criteria.

Virginia DEQ is in the process of developing nutrient criteria for Virginia.

Purpose of Presentation: Describe AAC's recommendations for Virginia's nutrient criteria process.

Outline:

- Describe AAC and its role
- Review recommendations
- Briefly describe planned activities
- Answer questions

Academic Advisory Committee to DEQ:

- Organized by Virginia Water Resources Research Center in late 1990s (1999?).
- Comprised of faculty from state Universities.
- Works with DEQ in an advisory capacity, responds to specific requests by DEQ.
- Annual membership varies with tasks.

2003-04 AAC Members:

E. Fred Benfield
Biology, VT

Theo A. Dillaha
Biological Systems Engineering, VT

Thomas J. Grizzard, Jr.
Civil and Environmental Eng., VT

Carl H. Hershner, Jr.
Marine Science, VIMS

Howard I. Kator
Marine Science, VIMS

Wu-Seng Lung
Civil Engineering, UVa

Saied Mostaghimi
Biological Systems Eng. , VT

John J. Ney
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Leonard A. Shabman
Resources for the Future

Eric P. Smith
Statistics, VT

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Kurt Stephenson
Agricultural and Applied Econ., VT

Jane Walker
Va Water Resources Research Ctr, VT

Gene Yagow
Biological Systems Engineering, VT

Tamim Younos
Va Water Resources Research Vtrr, VT

Carl E. Zipper (Chair)
Crop & Soil Environ. Sciences, VT

AAC Task, 2003-04:

Address nutrient criteria.

- Responded to specific questions: Part II of AAC report.
- Summary and Overview of Responses: Part I of AAC Report.

AAC members take responsibility for specific tasks based on experience, knowledge, expertise.

AAC Recommendations to DEQ

(Summarize Part 1 of Report)

Introduction and Conceptual Basis

Near-Term Recommended Approach
- General
- Lakes and Reservoirs
- Rivers and Streams

Longer-term Recommended Approach

AAC Report:

Introduction and Conceptual Basis

Fundamental Question:

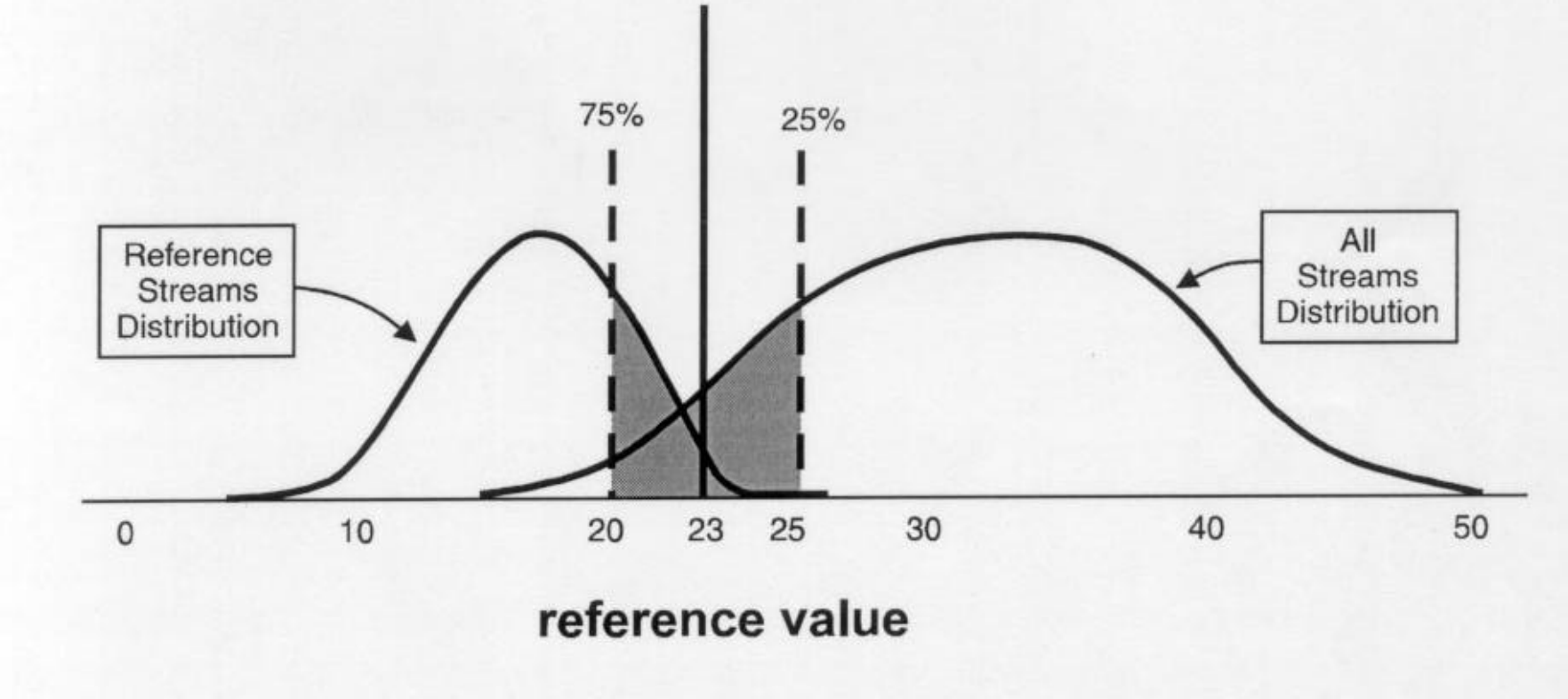
How should the presence or absence of “clean water” be determined?

What should be the basis for nutrient criteria establishment?

CWA Sec.303: "… water quality standard shall consist of the designated uses of the navigable waters … and the water quality criteria for such waters based upon such uses … [shall] protect the public health or welfare, … shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other purposes …

Code of Federal Regulations describes criteria as *"elements of State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use"* [40 CFR 131.3(b)]

EPA defines “Guidance Criteria”* as 25th percentile of all water bodies.



* To be imposed by EPA, in states that fail to develop their own criteria

Near-Term Recommendations:

Endeavor to establish nutrient criteria by EPA deadlines (lakes and reservoirs' criteria by 2006, streams and rivers' criteria in 2007), avoid "guidance criteria" implementation.

Rationale:

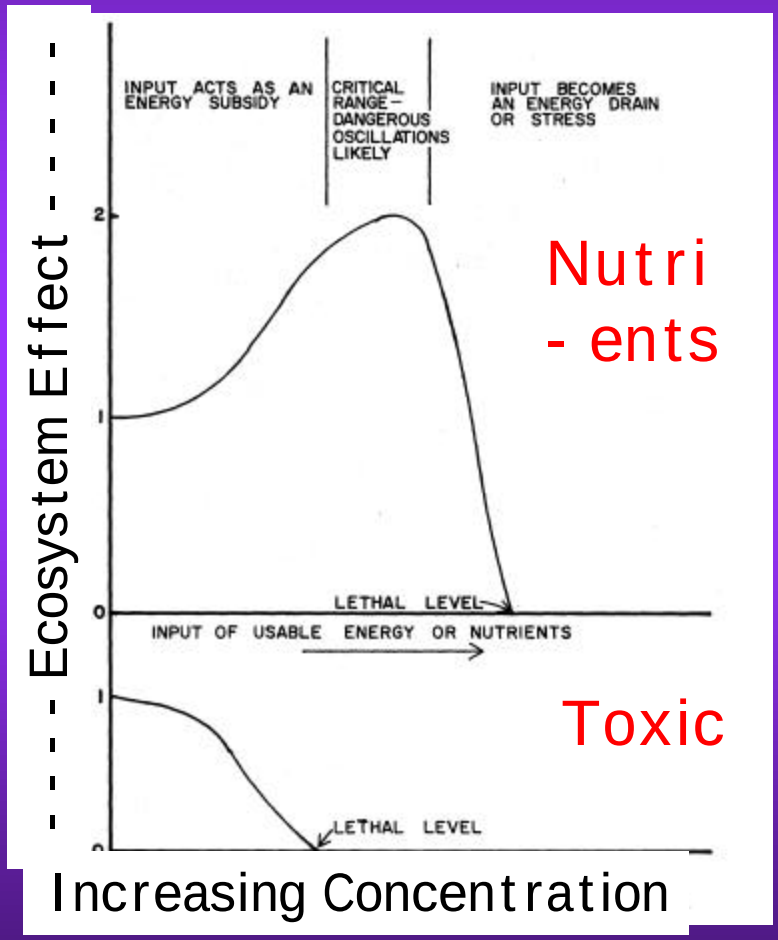
- Committee sees no basis to assume that 75% of Virginia's water bodies are impaired.

- Guidance criteria would divert scarce DEQ resources from actual problems.

Protection of designated use should be the basis for establishing criteria.

Rationale:

- Language defining criteria in CWA, CFR.
- Fundamental nature of nutrients in aquatic systems.
- All but 2 Va lakes & reservoirs are constructed impoundments.



Lakes and Reservoirs:

Natural lakes and constructed impoundments should be considered separately.

Rationale: Extensive scientific evidence that these systems respond differently to nutrient inputs (impoundments tend to have larger watersheds, lower retention times, more non-algal turbidity … require greater management as a result of having been constructed …)

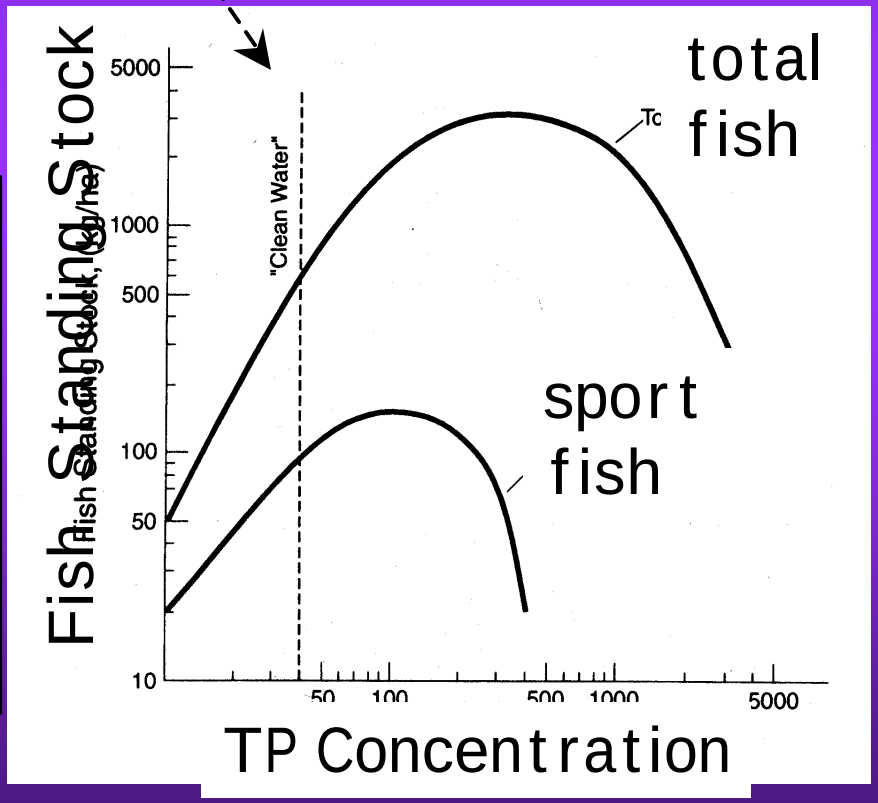
From here forward: will discuss impoundments.

Principal designated uses for impoundments:

-Aquatic life
-Recreation (swim, fish …)
-Public water supply

"Clean water," as perceived for swmming

DEQ can expect that conflicts between nutrient requirements of specific uses will arise.



In constructed impoundments, recreational fish population status can be an indicator of suitability for aquatic life.

Rationale:

- most impoundments are used or managed for recreational fishing.

- recreational fish species are generally the highest trophic level.

Recreational fish status can be assessed by obtaining VDGIF biologist ratings.

Rationale: Fish population data that represent a number of impoundments, and are comparable, are not available and would be expensive to gather.

VDGIF ratings to be analyzed for nutrient effects by impoundment fishery type.

Warm water … Cool water … Trout

User perception surveys, if designed, administered, and analyzed in a scientifically valid manner, would be an appropriate means for assessing suitability for recreational uses.

AAC makes no recommendations regarding public water supply suitability.

AAC expects that nutrient criteria would be expressed as water column chlorophyll a.

Rationale: Chl_a is an indicator of algal biomass, which can impair designated uses at excessive levels.

Criteria should be expressed as TP *only* if TP-chl_a relationships are predictable.

Rationale: TP-chl_a relationships are more variable in impoundments than in natural systems.

Nitrogen criteria should not be established.

Rationale: Potential for N reductions, if applied independently of P, to stimulate blue-green algae, which affect designated use negatively

Rivers and Streams:

Periphytic algae in wadeable streams and planktonic algae in non-wadeable streams should be considered as the primary indicator of use suitability.

Consider downstream loading effects for rivers & streams, not for lakes & reservoirs.

Rationale:

- Stream segments can contribute nutrients to downstream water-body impairments.
- Constructed impoundments often act as nutrient traps.
- EPA documentation is explicit in this regard.

Problem: Data / modeling capability.

Lakes/Reservoirs, and Rivers/Streams:

Build *systematic* evaluation / refinement of criteria and water-body classifications into the process.

- Evaluate numeric criteria violations: is designated use impaired?

- Evaluate waters through monitoring program or other means: is designated use impaired?

Evaluation / Refinement Rationale:

- Processes governing nutrient impairment are complex.
- Virginia's water resources are diverse.
- Resources available for criteria development are limited.
- Results of criteria implementation will have economic and environmental impacts across the state.

Longer-term Recommendations:

Expand database describing water-body uses, features, physical conditions.

Rationale:

- Water body characteristics will influence biological response to nutrient inputs.
- Classification and use designation are the tools available for refining criteria application.
- Better descriptive data will aid evaluation and refinement.

Enhance capability to consider downstream loading effects in criteria implementation.

Rationale:

- Challenges of protecting Virginia's waters from nutrient overenrichment (increasing population & economic activity, point/non-point ratio …)
- Potential for greater federal involvement in coastal water protection.

Problem: Expense, combined with current resource limitations

FY04-05 AAC Work Plan: Reservoirs

- Analyze DEQ monitoring data for correspondence to VDGIF fishery status, as influenced by impoundment characteristics.

- Review scientific literature: nutrient requirements for major fishery types.

Warm water
Cool water
Trout lakes

FY04-05 AAC Work Plan:
Rivers and Streams

- Review scientific literature : methods for defining undesirable (nuisance) algae levels.

- Workshop with EPA and other eastern states, to exchange information about nutrient criteria development.

- Become informed regarding ongoing EMAP and USGS nutrient studies that include Va locations.

Questions